

REMARKS

The Examiner is thanked for the careful examination of the application. However, in view of the following remarks, the Examiner is respectfully requested to reconsider and withdraw the outstanding rejections.

The present invention relates to a multi-tone image processing method and apparatus. According to the preferred embodiment illustrated in Figure 10, a plurality of density patterns are disclosed, wherein each pattern represents a unique density level. For example, density pattern PSB0 represents the lightest density level, generally referred to as level 0. The next pattern, PSB1 represents a density level of 1, and so on through PSB 128, which represents the darkest density level of 128. See column 6, lines 3-6. Each exposure pattern comprises a matrix of elements DT. See column 3, lines 62-64. In the embodiment illustrated in Figure 10, the matrix pattern size is 4 (vertical) by 16 (horizontal). See column 3, lines 48-50.

The density of each matrix is determined, not only by the number of elements that are darkened, but also by the particular arrangement of the elements. Note that matrices PSA2, PSA3, and PSA4 of Fig. 6, each include five darkened elements DT, but represent different density levels, as illustrated in Figure 8 and discussed at column 5, lines 29-50. Note also in Figure 10, matrix PSB2 represents density level 2 and PSB3 represents a higher density level 3, yet both matrices have seven darkened elements DT.

Matrix pattern PSB8, representing density level 8 includes eleven elements darkened, whereas matrix pattern PSB9, which represents a darker density level of 9 includes only 10 elements. Accordingly, according to the present invention, it is possible

to use a fewer number of elements to represents a darker density, by careful arrangement of the elements.

Claim Rejections - 35 U.S.C. §112:

Claim 35 has been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particular point out and distinctly claim the subject matter that the Applicant regards as the invention. The Examiner alleges that in line 6 of claim 35, the term "larger" should be changed to "fewer". However, claim 35 is correct as written. As set forth in the example above, it is possible to have a lighter tone level with a larger number of recording dots than a darker tone level. Specifically, in the example using PSB8 and PSB9, the lighter tone level of PSB8 uses eleven elements, whereas the darker tone level of PSB9 uses only ten. Accordingly, claim 35 is correct as written.

Art Rejections:

Claims 24, 29-32 and 35 have been rejected under 35 U.S.C. §102(b) as being allegedly anticipated by U.S. Patent No. 4,698,778, hereinafter *Ito*. *Ito* discloses in Figure 2a and 2b a plurality of density patterns representing density levels from 0 to 63. The order in which the pixels are darkened to represent a darker density level are illustrated in the corresponding mother patterns set forth in Figure 1. However, the number of pixels illuminated in each density pattern in *Ito* corresponds to the density level. For example in density 0, there are 0 illuminated pixels. In density level 1, there is 1 pixel illuminated and in density level 2 there are two pixels illuminated. The one exception is in density level

63, wherein there are 64 pixels illuminated. Accordingly, to increase one density level in the *Ito* patterns an additional pixel is illuminated, except for the jump between density level 62 to 63, where an additional two pixels are illuminated. Accordingly, *Ito* does not teach or suggest a plurality of density patterns, wherein a darker density level may be expressed by a fewer number of pixels than a lighter density level.

Claim 24 refers to a plurality of patterns, wherein each pattern represents a specific tone level and at least one of the patterns has a larger number of recording operations than another of the patterns that represents a darker tone level within the specific range.

Accordingly, *Ito* does not teach or suggest the method of claim 24.

Claim 29 defines an apparatus comprising, among other elements, a memory which stores a plurality of patterns, wherein at least one of the patterns has a larger number of effective cells than another of the patterns that represents a darker tone level within the specific range.

Claim 31 defines a multi-tone image recording apparatus which includes, among other elements, a memory which stores a plurality of patterns, wherein at least one of the patterns has a larger number of effective cells than another of the patterns that represents a darker tone level within the specific range.

Claim 30 depends from claim 39 and claim 32 depends from claim 31.

Claim 35 defines an apparatus that includes, among other elements, a converter which converts multi-tone image data into recording data so that at least two tone levels are realized by differentiating positions of recording dots within a specific range while a lighter

tone level has a larger number of recording dots than a darker tone level within a specific range.

Accordingly, each of claims 24, 29-32 and 35 are patentable over *Ito* in view of the fact that *Ito* uses a progressively higher number of pixels to represent darker density levels.

Claims 17-23 have been rejected under 35 U.S.C. §103(a) as being unpatentable over a combination of *Ito* and U.S. Patent No. 5,258,780, hereinafter *Ema*.

Claim 17 defines an apparatus that includes, among other elements, a memory which stores a plurality of exposure patterns, wherein at least two of said plurality of exposure patterns are identical in a number of the irradiations, but different in the positions of the irradiations, within said specific range for realizing different tone levels, wherein the size of the areas developed by the developing device within said specific range are different. See page 12 for support for the amendments to claim 17.

The Examiner relies upon *Ito* for at least this portion of claim 17. In view of the fact that *Ito* uses a correspondingly increasing number of pixels for each increase in density, *Ito* does not teach or suggest the subject matter of claim 17, either by itself, or in combination with *Ema*.

Furthermore, none of the cited prior art teaches or suggests the additive affect that is disclosed on pages 11-12 of the specification, and which contributes to the newly added portion of claim 17. However, the present invention is not limited to the preferred disclosed embodiments.

The Examiner is also respectfully requested to consider new claims 37-38, which depend from claim 17. Claims 37-38 are allowable at least for the reasons set forth above with respect to claim 17.

The Examiner is thanked for returning applicants' PTO-1449 form that was filed on April 9, 1999. However, a complete translation of JP 61-23466 was filed with the Information Disclosure Statement, not just a translation of the Abstract. A copy of the translation and the April 9, 1999 postcard receipt are attached. The Examiner is respectfully requested to acknowledge receipt of the complete translation.

In view of the foregoing remarks, the Examiner is respectfully requested to reconsider and withdraw the outstanding rejections.

In the event that there are any questions concerning this response, or the application in general, the Examiner is respectfully urged to telephone the undersigned attorney so that prosecution of the application may be expedited.

Respectfully submitted,

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Date: May 7, 2003



Attachment to Amendment dated May 7, 2003

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Marked-up Claim 17

MAY 0-9-2003

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17. (Amended) A multi-tone image recording apparatus comprising:
a photosensitive member which moves in a sub-scanning direction;
a laser optical system which selectively generates a laser beam and scans said photosensitive member with a spot of the laser beam in a main scanning direction substantially perpendicular to said sub-scanning direction,
a developing device which develops areas irradiated by the spot of the laser beam with developer;
a memory which stores a plurality of exposure patterns corresponding to a plurality of tone levels, respectively, each of said plurality of exposure patterns defining a number of irradiation by the spot of the laser beam and the positions of the irradiation within a specific range, at least two of said plurality of exposure patterns being identical in the number of the irradiation but different in the positions of the irradiation within said specific range for realizing different tone levels, wherein a size of the area developed by the developing device within said specific range is different for each tone level;
a controller which receives multi-tone image data representing a tone level of a multi-tone image and specifies one of said plurality of exposure patterns in response to the multi-tone image data; and
a driver which drives said laser optical system to control generation of the laser beam by reviewing the exposure pattern specified by said controller.